



PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Shoji HARA *et al.*

Appln. No.: 09/782,169

Group Art Unit: 1762

Filed: February 14, 2001

Examiner: Brian K. Talbot

For: Laminate Comprising Polyimide and Conductor Layer, Multi-Layer Wiring Board with the Use of the Same and Process for Producing the Same

DECLARATION UNDER 37 C.F.R. §1.132

Commissioner for Patents
Alexandria, VA 22313-1450

Sir/Madam:

I, Masaru NISHINAKA, do declare and state that:

I graduated from Osaka City University, Faculty of Engineering, Department of Applied Physics, with a degree in Industry, receiving a Master's Degree in March of 1992.

Since April of 1992, I have been employed by KANEKA CORPORATION, where I am engaged in research and development relating to the synthesis of polyimide films/articles, the surface treatments, and the metallizing.

I am familiar with the prosecution history of the above-identified application including the Office Action dated September 9, 2003 in the above-identified application.

I am a co-inventor of the invention described and claimed in the above-identified application.

The following experiment was conducted by me or my direct supervision in order to demonstrate the superiority of the present invention.

EXPERIMENTATION

1. Example 5 (Vacuum evaporation)

A sample was prepared in the same manner as in Example 4 of the present specification except that copper was vapor deposited in a thickness of 0.2 μm with use of an electron beam-heating type vacuum vapor depositing apparatus (EBH-6, manufactured by ULVAC, Inc.) under the conditions of a degree of vacuum of 1.3×10^{-2} Pa and a film formation rate of 20 $\text{\AA}/\text{sec}$ in place of the sputtering method employed in Example 3.

The pressure and period for the pressurizing and heating treatment were the same as those in Example 3, but the heating temperature for sample preparation was 220°C. Thereafter, a pattern for measuring the peel strength of 3 mm in width was produced in the same manner as in Example 3, and the peel strength was measured to give a value of 4.8 N/cm. Table 1 summarizes the measurement results.

2. Example 6 (Ion plating)

By using an arc discharge type high vacuum ion plating apparatus (AIF-850SB, manufactured by Shinko Seiki Co., Ltd.) instead of the electron beam-heating type vacuum vapor depositing apparatus used in Example 5 as above, a 3.8 μm thick copper layer was formed under the operating condition of a bombarding wattage of 300, an ionization potential of 40 v, an ionization current of 10 A, and an RF50 W, at a film formation rate of 160 $\text{\AA}/\text{sec}$ and a film formation period of 235 sec.

Thereafter, a sample was prepared in the same manner as in Example 5. The peel strength of the resulting sample was measured to give a value of 5.4 N/cm. Table 1 summarizes the measurement results.

Table 1

	Process	Heating Temp (°C)	Peel Strength (N/cm)
Example 2 (laminate of a thermoplastic polyimide and a non- thermoplastic polyimide)	Sputtering → Electroplating → Heating	170	4.2
		220	4.4
Example 4 (laminate of a thermoplastic polyimide and a non- thermoplastic polyimide)	Sputtering → Heating and pressurizing → Electroplating	220	5.0
		250	5.6
Example 5 (laminate of a thermoplastic polyimide and a non- thermoplastic polyimide)	Vacuum Vapor Deposition → Heating and pressurizing → Electroplating	220	4.8
Example 6 (laminate of a thermoplastic polyimide and a non- thermoplastic polyimide)	Ion Plating → Heating and pressurizing → Electroplating	220	5.4
Comparative Example 4 (laminate of a thermoplastic polyimide and a non- thermoplastic polyimide)	Sputtering → Electroplating	None	1.8

Conclusion

From the results as above, in the present invention, the adhesive strength of the laminate was extremely improved due to the existence of a thermoplastic polyimide and heating treatment, in accordance with a vapor evaporation method, ion plating method as well as a sputtering method.

I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, at Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date : September 29th, 2004 Name : Masaru Nishinaka

Masaru NISHINAKA